ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	HASSLACHER Holding GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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HASSLACHER CROSS LAMINATED TIMBER
according to ETA-12/0281, issued on 09.11.2020

HASSLACHER Holding GmbH

Institut Bauen und Umwelt e.V.

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HASSLACHER NORICA TIMBER
From wood to wonders.

1. General Information

HASSLACHER Holding GmbH	HASSLACHER CROSS LAMINATED TIMBER
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** HASSLACHER Holding GmbH Feistritz 1 9751 Sachsenburg Austria
Declaration number EPD-HAS-20210172-IBD1-EN	**Declared product / declared unit** 1 m³ HASSLACHER CROSS LAMINATED TIMBER with an average density of 470 kg/m³ (Moisture at delivery = 11 %)
This declaration is based on the product category rules: Solid wood products, 12.2018 (PCR checked and approved by the SVR)	**Scope:** This document refers to average HASSLACHER CROSS LAMINATED TIMBER of the HASSLACHER group. This EPD includes data of the NORITEC Holzindustrie GmbH in Stall im Mölltal (Austria) and represents 100 % of HASSLACHER's CROSS LAMINATED TIMBER production in the year of reference.
Issue date 10/09/2021	
Valid to 02/08/2026	The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
	Verification The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Matthias Klingler (Independent verifier)

2. Product

2.1 Product description/Product definition

HASSLACHER CROSS LAMINATED TIMBER from the HASSLACHER Group is a solid, panel-shaped timber construction element consisting of layers of softwood bonded at right angles to each other. HASSLACHER CROSS LAMINATED TIMBER is manufactured in accordance with *ETA-12/0281* of 09.11.2020.

HASSLACHER CROSS LAMINATED TIMBER is manufactured at the sites NORITEC Holzindustrie GmbH in Stall im Mölltal (Austria) and, since 2021, at NORDLAM GmbH in Magdeburg (Germany). The data of the production site of NORITEC Holzindustrie GmbH in Stall im Mölltal (Austria) for the reference year 2019 have been included in this EPD. NORDLAM GmbH Magdeburg produces with the same technologies.

The crosswise bonding of the individual lamellas and the generally symmetrical structure of HASSLACHER CROSS LAMINATED TIMBER has the advantage of extremely high dimensional stability, as well as potential load transfer both longitudinally and transversely to the main load-bearing direction.

HASSLACHER CROSS LAMINATED TIMBER is defined in its cross-sectional structure by a minimum number of layers of at least three, whereby the maximum number of layers is limited to eleven.

HASSLACHER CROSS LAMINATED TIMBER is available in two different strength classes, i.e. CL26E11.8 and CL36E14.7, according to *ETA-12/0281*.

Due to the existing joinery and surface finishing options integrated in the production plants, a high

degree of prefabrication and thus a shortened construction time can be achieved.

Production is subject to in-house and external monitoring in accordance with *ETA-12/0281*.

For the placing of the product on the market in the European Union/European Free Trade Association /EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration *ETA-12/0281*, HASSLACHER CROSS LAMINATED TIMBER and the CE-marking.

For the application and use the respective national provisions apply.

2.2 Application

HASSLACHER CROSS LAMINATED TIMBER is used in all structural areas of modern timber construction in service classes 1 and 2 according to *EN 1995-1-1* in the form of structural elements with predominantly static traffic loads.

The use of preventive chemical wood preservation according to *DIN 68800-3* is unusual and only permissible if structural wood preservation according to *DIN 68800-2* alone is not sufficient. If, in exceptional cases, a preventive chemical wood preservative is used, this must be regulated by a general building authority approval or approval according to the Biocidal Products Regulation.

2.3 Technical Data

The structural data for HASSLACHER CROSS LAMINATED TIMBER according to *ETA-12/0281* are given.

Structural data

Name	Value	Unit
Wood species according to EN 1912 and letter codes, if any, in accordance with EN 13556 1)	PCAB (Norway spruce) ABAL (Silver fir) PNSY (Scots pine) LADC (Europ. larch) LASI (Siberian larch) additionally soft- and hardwood according to ETA-12/0281	
Mean humidity acc. to EN 13183-1 2)	11 ± 2	%
Use of wood preservatives (the test rating of the wood preservative according to DIN 68800-3 must be stated) 3)	Iv, P and W	-
Characteristic value of compressive strength parallel to the grain of hardwood lamellas acc. to ETA-12/0281 and EN 338 4)	21.0 | 24.5	N/mm²
Characteristic value of compressive strength perpendicular to the grain of hardwood lamellas acc. to ETA-12/0281 and EN 338 4)	2.5	N/mm²
Characteristic value of tensile strength parallel to the grain of hardwood lamellas acc. to ETA-12/0281 and EN 338 4)	14.0 | 19.5	N/mm²
Characteristic value of tensile strength perpendicular to the grain of hardwood lamellas acc. to ETA-12/0281 4)	0.12	N/mm²
Modulus of elasticity with slab stress parallel to the grain acc. to ETA-12/0281 4)	11600 | 14700	N/mm²
Modulus of elasticity with panel stress parallel to the grain acc. to ETA-12/0281 4)	11800 | 14700	N/mm²
Rolling shear strength with panel stress acc. to ETA-12/0281 4)	1.50	N/mm²
Rolling shear modulus with panel stress acc. to ETA-12/0281 4) (mean)	50	N/mm²
Dimensional deviation according to test plan OIB-205-082/15-PPL of ETA-12/0281	Length, width (< 3 m): +0/-5 mm; (> 3 m): +0/-7 mm; thickness: + 2 mm for wall and ceiling elements; + 4 mm for roof elements; diagonal (< 6 m): + 5 mm; (> 6 m): + 7 mm; opening dimensions: + 3 mm	mm
Mean density of load-bearing elements	420 | 480	kg/m³
Surface quality	Excellent surface Visual quality Industrial visual quality Industrial quality	-
Thermal conductivity (perpendicular to grain) acc. to ISO 10456	0.12	W/(mK)
Specific heat capacity acc. to ISO 10456	1600	J/(kgK)
Water vapour diffusion resistance factor acc. to ISO 10456 5)	μ = 50 (dry) to 20 (wet)	-

[1] For cross laminated timber of predominantly softwood.
[2] *ETA-012/281* allows for different equivalent measurement methods.
[3] According to *DIN 68800-1*, wood preservative treatment is only permissible if structural measures have been exhausted and is therefore unusual.
[4] According to *ETA-12/0281* with *EN 338* and *EN 16351* the cross-sectional properties are determined. Depending on the strength class of the cross laminated timber, the strength classes C24/L25 or T14 as well as C40/L40 or T26 are assigned. The declared density values may deviate from these average values due to different densities of the wood species used.
[5] The water vapour diffusion equivalent air layer thickness is determined from the product of the layer thickness with the water vapour diffusion resistance number.

Performance data of the product HASSLACHER CROSS LAMINATED TIMBER in accordance with the declaration of performance with respect to its essential characteristics according to *ETA-12/0281*, *HASSLACHER CROSS LAMINATED TIMBER* (not part of CE-marking).

2.4 Delivery status

HASSLACHER CROSS LAMINATED TIMBER is produced and supplied in the following dimensions:

	Standard format	Large format
Thickness:	(60) 90 to 280 mm	(60) 80 to 360 mm
Width:	1.25 m	2.20 to 3.20 m
Length:	up to 24.0 m	up to 20.0 m

2.5 Base materials/Ancillary materials

HASSLACHER CROSS LAMINATED TIMBER is composed of at least three board lamellas bonded crosswise, which have previously been technically dried and visually or mechanically graded according to strength.
2-component melamine-urea-formaldehyde adhesives (2-K-MUF) are used for the heat-resistant and shear-resistant surface bonding of the board layers. For the optional narrow side bonding of the lamellas, 2-component melamine-urea-formaldehyde adhesives are also used.
The emission of formaldehyde is declared according to *EN 14080*.

The averaged proportions of ingredients per m³ of HASSLACHER CROSS LAMINATED TIMBER for the environmental product declaration are:
- Softwood, mainly spruce, approx. 88 - 90 %.
- Water approx. 9 - 10 %
- MUF adhesives approx. 1 - 2 %.

The product has an average density of 470 kg/m³.

This product/article/at least one partial article contains substances listed in the candidate list (19.01.2021) exceeding 0.1 percentage by mass: no.

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no.

2.6 Manufacture

HASSLACHER CROSS LAMINATED TIMBER is manufactured from spruce, fir, pine, larch, birch, oak and Swiss stone pine, whereby the larch, birch, oak and Swiss stone pine species are primarily used in the form of 'Excellent' lamellas for top layers in so-called 'Excellent' quality.
For the production of HASSLACHER CROSS LAMINATED TIMBER, conventional sawn timber is first dried to below 15 % wood moisture (target moisture content: approx. 12 + 2 %), pre-planed and graded visually or mechanically according to strength. Identified areas with strength-reducing spots are cut out depending on the desired strength class. The cut lamellas are finger-jointed to form endless lamellas.
The thickness range of the planed single lamellas is 19 to 45 mm, with a width of 80 to 300 mm.
The crosswise bonding of the lamellas is carried out using the adhesive listed in chapter 2.5.
'Excellent' lamellas according to *ETA-12/0281* or wood-based panels according to *EN 13986* can also be used for the visual qualities.
After the adhesive has fully cured, the final surface treatment is carried out as well as the customised joinery and packaging. If required, treatment with wood preservatives or surface finishes (end-grain protection, UV protection, etc.) can be carried out before packaging.

2.7 Environment and health during manufacturing

Accruing exhaust air is purified in accordance with legal requirements. No pollution of water and soil takes place. The resulting waste water is fed into the local sewage system.

2.8 Product processing/Installation

HASSLACHER CROSS LAMINATED TIMBER can be processed with suitable tools commonly used in solid timber processing. On request, products can also be processed on both sides in the factory.
Occupational safety instructions must also be observed during processing/assembly.

2.9 Packaging

Polyethylene, solid timber, paper and cardboard as well as small amounts of other plastics are used.

2.10 Condition of use

The composition for the period of use corresponds to the basic material composition according to section 2.5 "Base materials/Ancillary materials".
During use, about 200 kg of carbon are bound within the product. This corresponds to about 750 kg CO_2 in the case of complete oxidation.

2.11 Environment and health during use

Environmental protection: According to the current state of knowledge, hazards to water, air and soil cannot arise if the products are used as intended.

Health protection: According to the current state of knowledge, no health hazards or impairments are to be expected.
With regard to formaldehyde, HASSLACHER CROSS LAMINATED TIMBER is low in emissions (formaldehyde emissions class E1).
MDI emissions are not measurable in HASSLACHER CROSS LAMINATED TIMBER bonded using MUF adhesives as these adhesives do not contain MDI.

2.12 Reference service life

HASSLACHER CROSS LAMINATED TIMBER corresponds to glued laminated timber (glulam) in its components and production. Glued laminated timber has been used for over 100 years.
When used as intended, no end to its durability is known or to be expected.
The service life of HASSLACHER CROSS LAMINATED TIMBER is therefore the same as the service life of the building when used as intended.

2.13 Extraordinary effects

Fire
Fire performance acc. to *EN 13501-1*

- Fire classification D – normal flammable
- Smoke class s2 – normal smoke production
- Flaming droplets d0 – no dripping
- The toxicity of the fire gases corresponds to that of natural wood.

Structural fire resistance
The burn rate of HASSLACHER CROSS LAMINATED TIMBER (1st layer) is 0.65 mm/min and 0.80 mm/min for every subsequent layer.
The 'Zero-strength layer' d0 is 7 mm thick.

Water
No ingredients are washed out that may be hazardous to water.

Mechanical destruction
The break pattern of HASSLACHER CROSS LAMINATED TIMBER shows an appearance typical of solid timber.

2.14 Re-use phase
In the case of selective deconstruction, HASSLACHER CROSS LAMINATED TIMBER can be re-used or re-utilised without any problems after the end of the utilisation phase in the sense of cascading utilisation ("re-use").
If it is not possible to reuse or re-utilise HASSLACHER CROSS LAMINATED TIMBER, it can be thermally recycled to generate process heat and electricity due to its high calorific value of approx. 19 MJ/kg.

2.15 Disposal
It is impermissible to dispose of waste wood via landfills.

Waste classification: Classification code 17218 (Wood waste, organically treated) according to the Waste Catalogue in accordance with Annex 5 of the Austrian *Waste Catalogue Ordinance;* Waste Code according to the European Waste Catalogue (EWC): 17 02 01.

2.16 Further information
You can find further information at www.hasslacher.com

3. LCA: Calculation rules

3.1 Declared Unit
This EPD refers to a declared unit of 1 m³ of HASSLACHER CROSS LAMINATED TIMBER with an average density of 470 kg/m³ at 11 % moisture at delivery.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	470	kg/m^3
Wood moisture at delivery	11	%
Conversion factor to 1 kg [Mass/Declared Unit]	470	-

HASSLACHER CROSS LAMINATED TIMBER is manufactured at the Stall im Mölltal (Austria) site of the HASSLACHER group and since 2021 also in Magdeburg (Germany). This EPD includes data of the NORITEC Holzindustrie GmbH in Stall im Mölltal (Austria) referring to the production year 2019.

The declared unit was calculated on a volume-weighted basis. This EPD refers to an average product produced at one site. All products undergo the same processing steps. A possible variability is only expected due to the use of different wood species. The upstream chain for spruce is considered as representative. The robustness of the declared LCA values can thus be classified as high.

3.2 System boundary
The life cycle assessment of HASSLACHER CROSS LAMINATED TIMBER refers to a cradle-to-gate analysis of the environmental impacts with modules C1-C4 and D (A1-A3, + C, +D). The following life cycle phases are taken into consideration in the analysis:

Module A1-A3 | Production stage
The production stage includes the upstream burdens of raw material supply (sawn timber, production of the adhesive system, etc.) and their transports to the manufacturing plant in Stall. Sorting, planing, finger-jointing, chamfering and joining, including the packaging of the product, are taken into account. The share of electricity demand covered by green electricity is 100 % (emission factor GWP-total: 13 g CO_2 equivalent/kWh). Thermal energy is provided from the energetic use of wooden residues from the production process.

Module C1 | Deconstruction and demolition
After the removal of building components overlying the product, the joints can simply be loosened by screwing or sawing and lifted by cranes to the place of removal. Required energy demand can be neglected. The actual energy demand depends on the installation of the products and can therefore vary greatly in the building context.

Module C2 | Transport to disposal
Module C2 includes the transport to waste treatment. In this case, transport by truck over a transport distance of 50 km is assumed.

Module C3 | Waste processing
In Module C3, the chipping after removal of the products is considered. The wooden products and with them the material-inherent properties leave the product system as secondary fuel in module C3.

Modul C4 | Disposal
The applied scenario declares the energetic recovery of the wooden products; therefore, no environmental impacts are to be expected from waste processing of the products in C4.

Modul D | Benefits and loads beyond the system boundary
Applying an European average scenario, module D describes the energetic recovery of the product at the

end-of-life including the corresponding energy substitution potentials.

3.3 Estimates and assumptions

Assumptions and approximations are applied in case of a lack of representative data. All assumptions and approximations are documented precisely and represent a best-guess representation of reality.

A large part of the wood processed by HASSLACHER represents softwood. A generic data set from the *GaBi* database for spruce round timber was used as background data set. For other wood species used, the data set for spruce is regarded as an approximation.

Emissions from wood drying were included in the calculations according to *Rüter & Diederichs* (2012).

3.4 Cut-off criteria

The LCA model covers all available input and output flows, which can be represented based on robust data and from which a significant contribution can be expected. Data gaps are filled with conservative assumptions of average data or generic data if available and are documented accordingly.
Only data with a contribution of less than 1 % were cut off. Thus, no data were neglected, of which a substantial impact is to be expected. All relevant data were collected comprehensively. Cut-off material and energy flows were chosen carefully based on their expected quantitative contribution as well as potential environmental impacts. Thus, it can be assumed that the sum of all neglected input flows does not account for more than 5 % of the total material, water and energy flows.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *GaBi* database 2021.1 as well as recognised literature such as *Rüter & Diederichs* 2012.

3.6 Data quality

Data collection is based on industry-specific questionnaires. It follows an iterative process clarifying questions via e-mail, telephones calls or in personal and online meetings, respectively. Intensive discussions between HASSLACHER and Daxner & Merl result in an accurate mapping of product-related material and energy flows. This leads to a high quality of foreground data collected. Data collection relies on a consistent process according to *ISO 14044*.

The technological, geographical, and time-related representativeness of the database was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *GaBi* background datasets refer to the latest versions available (not more than ten years old) and are carefully chosen.

3.7 Period under review

Foreground data were collected in the 2019 production year, and the data are based on the volumes produced on an annual basis.

3.8 Allocation

Carbon content and primary energy content of the products were assessed based on their material-inherent properties according to underlying physical relationships. The allocation in the upstream supply chain of wooden products is based on the publication by *Hasch 2002* and its update by *Rüter & Albrecht 2007*.

During the production co-products such as off-cuts, chips, cross-cutting and planing losses are produced in addition to the declared product. Co-products are allocated based on their market price in accordance with the recommendations of *EN 16485*.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The *GaBi* background database was used to calculate the LCA (*GaBi* 10; 2021.1).

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
During tree growth, the wood assimilates carbon dioxide and stores biogenic carbon. The carbon stored in the product is declared in the following table.

Information on the biogenic carbon content at the gate

Name	Value	Unit
Biogenic Carbon Content in product	204	kg C

As the packaging amounts to far less than 5 % of the product mass, the biogenic carbon stored in the packaging does not have to be declared in the EPD.

End of life (C1-C4)

Name	Value	Unit
Energy recovery	470	kg

Reuse- recovery- and recycling potential (D), relevant scenario information

Name	Value	Unit
Processing rate	100	%
Efficiency of the plant	61	%

The product reaches the end of its waste status after removal from the building, transport to processing and chipping of the product. For the end of life of the HASSLACHER solid wood products, energy recovery as secondary fuel in a biomass power plant is assumed. As the main sales market for HASSLACHER products is concentrated in the European region, plant-specific characteristic values correspond to a European average scenario (EU28). The scenario considers a reprocessing rate of 100 % for the solid wood products after removal from the building. This

assumption has to be adjusted accordingly when applying the results in the building context. At the end-of-life of the product, the equilibrium moisture is comparable to the moisture content at delivery. This value can vary depending on the storage of the product before energy recovery.

5. LCA: Results

The following table contains the life cycle assessment results for a declared unit of 1 m³ HASSLACHER CROSS LAMINATED TIMBER with an average density of 470 kg/m³ (approx. 11 % moisture content).

Disclaimer:
EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ HASSLACHER CROSS LAMINATED TIMBER (470 kg/m³)

Core Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential - total	[kg CO_2-Eq.]	-6.60E+2	0.00E+0	1.42E+0	7.53E+2	0.00E+0	-4.10E+2
Global warming potential - fossil fuels	[kg CO_2-Eq.]	9.30E+1	0.00E+0	1.41E+0	3.74E+0	0.00E+0	-4.08E+2
Global warming potential - biogenic	[kg CO_2-Eq.]	-7.54E+2	0.00E+0	-1.67E-3	7.50E+2	0.00E+0	-1.42E+0
GWP from land use and land use change	[kg CO_2-Eq.]	6.72E-1	0.00E+0	1.15E-2	5.29E-3	0.00E+0	-3.19E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.88E-12	0.00E+0	2.77E-16	8.95E-14	0.00E+0	-5.32E-12
Acidification potential, accumulated exceedance	[mol H^+-Eq.]	6.11E-1	0.00E+0	4.66E-3	7.78E-3	0.00E+0	3.05E-1
Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg PO_4-Eq.]	2.42E-3	0.00E+0	4.17E-6	1.00E-5	0.00E+0	-6.05E-4
Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	2.65E-1	0.00E+0	2.14E-3	1.85E-3	0.00E+0	5.77E-2
Eutrophication, accumulated exceedance	[mol N-Eq.]	2.57E+0	0.00E+0	2.39E-2	1.94E-2	0.00E+0	6.98E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	6.90E-1	0.00E+0	4.20E-3	5.01E-3	0.00E+0	2.62E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.35E-5	0.00E+0	1.25E-7	1.10E-6	0.00E+0	-7.47E-5
Abiotic depletion potential for fossil resources	[MJ]	1.36E+3	0.00E+0	1.87E+1	6.65E+1	0.00E+0	-7.17E+3
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m³ world-Eq deprived]	1.60E+1	0.00E+0	1.30E-2	6.00E-1	0.00E+0	-1.05E+1

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ HASSLACHER CROSS LAMINATED TIMBER (470 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	3.18E+3	0.00E+0	1.08E+0	7.68E+3	0.00E+0	-1.83E+3
Renewable primary energy resources as material utilization	[MJ]	7.67E+3	0.00E+0	0.00E+0	-7.65E+3	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	1.08E+4	0.00E+0	1.08E+0	3.06E+1	0.00E+0	-1.83E+3
Non-renewable primary energy as energy carrier	[MJ]	1.30E+3	0.00E+0	1.88E+1	6.65E+1	0.00E+0	-7.17E+3
Non-renewable primary energy as material utilization	[MJ]	6.11E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	1.36E+3	0.00E+0	1.88E+1	6.65E+1	0.00E+0	-7.17E+3
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.65E+3
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m³]	1.48E+0	0.00E+0	1.23E-3	2.98E-2	0.00E+0	-1.20E+0

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ HASSLACHER CROSS LAMINATED TIMBER (470 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	[kg]	2.67E-6	0.00E+0	9.90E-10	1.76E-8	0.00E+0	-1.61E-6
Non-hazardous waste disposed	[kg]	2.63E+0	0.00E+0	2.95E-3	4.72E-2	0.00E+0	2.72E-1
Radioactive waste disposed	[kg]	2.94E-2	0.00E+0	3.41E-5	9.90E-3	0.00E+0	-5.89E-1
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	4.70E+2	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ HASSLACHER CROSS LAMINATED TIMBER (470 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Potential incidence of disease due to PM emissions	[Disease Incidence]	ND	ND	ND	ND	ND	ND
Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for ecosystems	[CTUe]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	ND	ND	ND	ND	ND	ND
Potential soil quality index	[-]	ND	ND	ND	ND	ND	ND

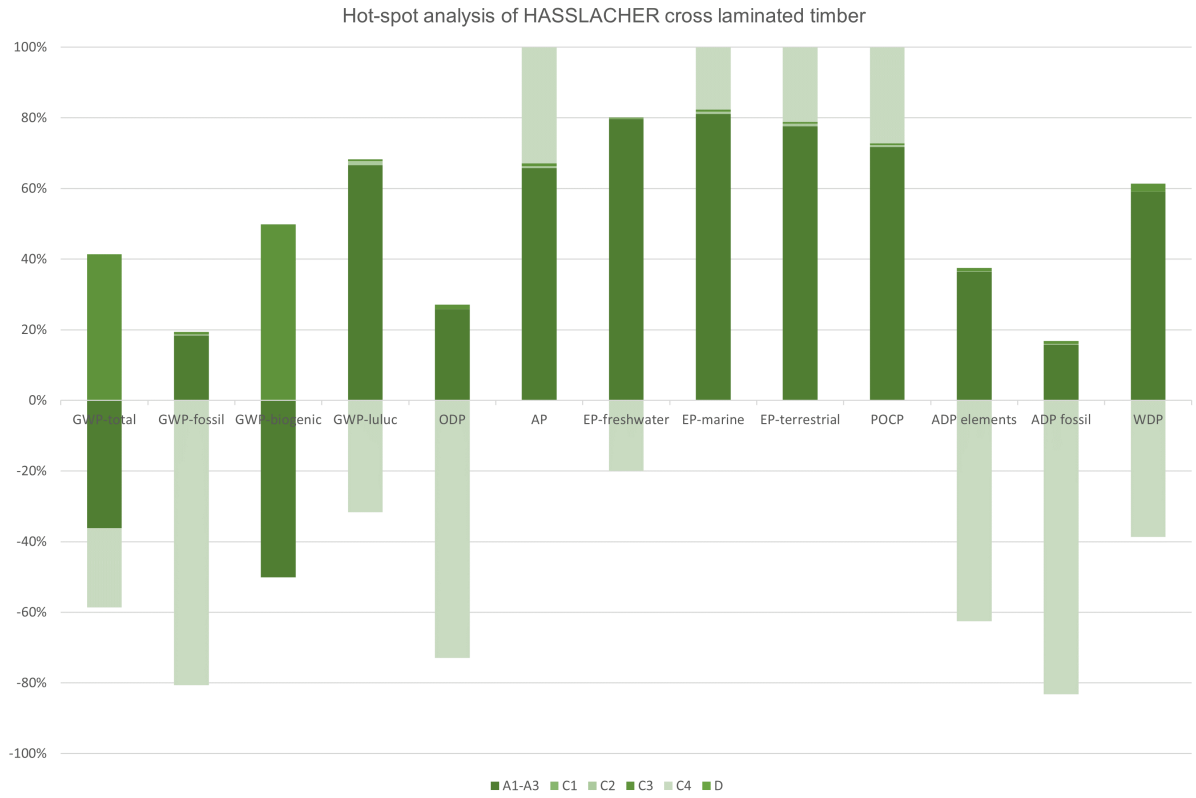
The additional and optional impact categories according to *EN 15804+A2* are not declared, as this is not required according to *PCR Part A*.

Disclaimer 1 – for the indicator “potential Human exposure efficiency relative to U235“:
This impact category deals mainly with the eventual impact of low dose ionizingradiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators: “abiotic depletion potential for fossil resources”, “abiotic depletion potential for non-fossil resources”, “water (user) deprivation potential”, “deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans - cancer effects”, “potential comparative toxic unit for humans – non-cancer effects”, “potential soil quality index”:
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results related to a declared unit of 1 m³ of average HASSLACHER CROSS LAMINATED TIMBER.



Global warming potential (GWP) shows a negative value in the production phase (modules A1-A3) of CROSS LAMINATED TIMBER. This is due to the material use of wood in the production and the sequestration of biogenic carbon in wood. Trees use carbon dioxide from the atmosphere in order to grow and thus bind carbon in their biomass (negative GWP). During the energetic treatment in a combined heat and power plant at the End-of-Life (module C3) the bound biogenic carbon is released to the atmosphere as carbon dioxide and thus contributes to potential global warming.

The negative values in module D can be explained by the fact that the energy generated by the energetic utilization of the product can replace the combustion of

fossil energy sources. Thus, more emissions of (mainlyfossil) energy sources are avoided than are emitted by using the energy stored in the wood. Environmental burdens (AP, EP, POCP) in module D are mainly caused by emissions from the combustion of biomass.

The interpretation of the results identifies the impacts from the upstream supply chain of sawn timber as the main driver in the environmental profile of CROSS LAMINATED TIMBER. The environmental impacts from forestry play an important role. Due to the use of green electricity in production, the provision of electricity at the site represents a minor contribution factor (except for the elementary use of resources).

7. Requisite evidence

7.1 Formaldehyde

Testing entity
Entwicklungs- und Prüflabor Holztechnologie GmbH

Place of test
Zellescher Weg 24, D-01217 Dresden

Test report
Test report no. 2513316 dated 13.08.2013

Test method
Test chamber method acc. to *EN 717-1*;
Chemical formaldehyde analysis: Acetylacetone method

Test result
Formaldehyde emissions 0.02 ppm HCHO/m³ air (acc. to 216 h) i.e. far below the limit value of formaldehyde class E1 at < 0.1 ppm HCHO/m³ air.

7.2 MDI

When bonding HASSLACHER CROSS LAMINATED TIMBER, 2-component melamine-urea-formaldehyde adhesives are used which do not contain MDI. MDI emission from the cured cross laminated timber is therefore not possible.

7.3 Toxicity of fire gases

The toxicity of the fire gases produced by burning cross laminated timber corresponds to those produced by burning untreated wood.

7.4 VOC-emissions

Testing entity
Holzforschung Austria – Österreichische Gesellschaft für Holzforschung

Place of test
Franz-Grill-Straße 7, A-1030 Vienna

Test report and test period
Test report no. 1317/2014/2 – HC
Test period 24.02.2015 to 19.03.2015

Test method and result
Test chamber procedure according to *ISO 16000-9*.
VOC emissions were analysed in accordance with *ISO 16000-6*.

AgBB result overview (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	N/A	µg/m³
R (dimensionless)	N/A	-

N/A - not available

In case of low emissions, it is possible to terminate a test after 7 days at the earliest and an additional sampling. The cross laminated timber sample tested met the specified discontinuation criteria on day 7.

AgBB result overview (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	311	µg/m³
R (dimensionless)	0.1	-

8. References

Standards

DIN 68800-1
DIN 68800-1:2019-06, Wood preservation – Part 1: General.

DIN 68800-2
DIN 68800-2:2012-02, Wood preservation – Part 2: Preventive constructional measures in buildings.

DIN 68800-3
DIN 68800-3:2020-03, Wood preservation – Part 3: Preventive protection of wood with wood preservatives.

EN 338
ÖNORM EN 338:2016-06-01, Structural timber – strength classes.

EN 717-1
ÖNORM EN 717-1:2005-02-01, Wood-based Panels – Determination of Formaldehyde Release, part 1: Formaldehyde emission by the chamber method.

EN 1912
ÖNORM EN 1912:2013-10-15, Structural timber – Strength classes – Assignment of visual grades and species.

EN 13183-1
ÖNORM EN 13183-1:2004-02-01, Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method.

EN 13501-1
ÖNORM EN 13501-1:2020-01-15, Fire classification of

construction products and building elements - Part 1: Classification using data from reaction to fire tests.

EN 13556
ÖNORM EN 13556:2003-09-01, Round and sawn timber. Nomenclature of timbers used in Europe.

EN 13986
ÖNORM EN 13986:2015-06-01, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

EN 14080
ÖNORM EN 14080:2013-08-01, Timber structures – glued laminated timber and glued solid timber – Requirements.

EN 15804
ÖNORM EN 15804+A2:2020-02-15, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

EN 16351
ÖNORM EN 16351:2015-11-15, Timber structures - Cross laminated timber - Requirements.

EN 16485
ÖNORM EN 16485:2014-05-01, Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction.

EN 1995-1-1
ÖNORM EN 1995-1-1:2019-06-01, Eurocode 5: Design of timber structures - Part 1-1: General – Common rules and rules for buildings.

ISO 10456
ÖNORM EN ISO 10456:2010-02-15, Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values.

ISO 14025
ÖNORM EN ISO 14025:2010-07-01, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

ISO 14044
DIN EN ISO 14044:2006-10. Environmental management
— Life cycle assessment — Requirements and guidelines.

ISO 16000-6
DIN ISO 16000-6:2012-11, Indoor air — Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

ISO 16000-9
OENORM EN ISO 16000-9:2011-12-15, Indoor air — Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method.

ETA-12/0281
ETA-12/0281 of 09.11.2020, European Technical Assessment for HASSLACHER CROSS LAMINATED TIMBER.

Further References

AgBB
German Committee for Health-Related Evaluation of Building Products (AgBB): Approach to health assessment of emissions of volatile organic compounds (VOCs and SVOCs) from building products.

Biocidal Products Regulation
Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

CPR
Regulation (EU) No. 305/2011 of the European Parliament and the Council of 9 March 2012 laying down harmonised conditions for the marketing of the construction products and on repealing Directive 89/106/EEC of the Council.

EWC
European Waste Catalogue - EWC, Ordinance on the European Waste Catalogue (Waste Catalogue Ordinance AVV) Waste Catalogue Ordinance of 10 December 2001 (BGBl. I S. 3379), last amended by Article 5 para. 22 of the law dated 24. February 2012 (BGBl. I S. 212).

ECHA Candidate List
List of substances of very high concern considered for approval (status 19.01.2021) according to Article 59 para. 10 of the REACH Regulation. European Chemicals Agency.

GaBi
GaBi 10, Software-System and Database for Life Cycle Engineering. DB v8.7 2020.2. Stuttgart, Echterdingen: Sphera, 1992-2020. Available at: http://documentation.gabi-software.com.

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Ökologische Betrachtung von Holzspan und Holzfaserplatten, Diss., University of Hamburg, amended in 2007: Rüter, S. (BFH HAMBURG; Timber Technology), Albrecht, S. (University of Stuttgart, GaBi).

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PCR part A
Product category rules for building-related products and services. Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019. Version 1.1. Berlin: Institut Bauen und Umwelt e.V., 2021.

PCR: Solid wood products
Product category rules for building-related products and services. Part B: EPD requirements for solid wood

products. Version 1.1. Berlin: Institut Bauen und Umwelt e.V., 10.12.2018.

Rüter & Diederichs 2012
Ökobilanz-Basisdaten für Bauprodukte aus Holz. Arbeitsbericht aus dem Institut für Holztechnologie und Holzbiologie Nr. 2012/1. Hamburg: Johann Heinrichvon Thünen-Institut.

Test plan OIB-205-082/15-PPL
ETA-12/0281 test plan dated 09. 11. 2020, European Technical Assessment for HASSLACHER CROSS LAMINATED TIMBER.

Waste Catalogue Ordinance
Waste catalogue according to Annex 5 of the Austrian Waste Catalogue Ordinance. Order of the Federal Minister for Sustainability and Tourism on a Waste Catalogue (Waste Catalogue Ordinance 2020).

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